U.S. 91 ABANDONMENT STUDY

Butte, Montana

Prepared by

Planning and Research Bureau
Montana Department of Highways

March, 1977

SUMMARY
REPORT ON THE ABANDONMENT
OF A SECTION OF U.S. 91-BUTTE

March, 1977

1. The Anaconda Company initially petitioned the State Highway Commission for abandonment of Old U.S. 91 in September, 1972. The abandonment petition requested that the section of highway be vacated from a junction with I-15 near Woodville Hill southwesterly to an intersection with Continental Drive at Farrell and Stuart Streets. Reasons for the petition included:

   a. The Anaconda Company was owner of a large percentage of the land abutting U.S. 91 right-of-way.

   b. The present right-of-way of U.S. 91 was necessary for planned expansion in the area of mining and related operations.

2. As of February 3, 1977 the Anaconda Company had acquired all property in the East Butte-McQueen area with the exception of 24 single family units, 3 small commercial establishments, 2 Volunteer Fire Department buildings and 1 playground. There were also about 40 mining claims located near the junction of U.S. 91 and I-15 that were not owned by the Anaconda Company as of that date. Twenty four of the privately owned claims have direct access to U.S. 91 R/W. The other 16 mining claims are isolated and would be forced to utilize access over privately owned land to reach U.S. 91.

3. The Anaconda Company has stated that all remaining privately owned property abutting the U.S. 91 R/W will have been acquired by July 1, 1977.

4. Several alternates to the U.S. 91 access to Butte have been investigated. These include:

   a. Interchange with I-15 near Columbia Gardens

   b. Interchange with I-15 and I-90 at the Continental Drive separation

   c. Improvements to the Harrison Avenue Interchange

   d. Frontage road on the west side of I-15 from Woodville Hill southwesterly to Continental Drive.

5. Traffic volumes have steadily decreased on Old U.S. 91 since the construction of I-15 from a high of 823 vehicles per day in 1970 to 530 vehicles per day in 1977. This decline in usage amounts to about 36 percent in the 7 year period at a count station located just east of East Butte.

6. About 433 vehicles per day or 29 percent of the total traffic using I-15 north of the junction with Old U.S. 91 turn off I-15 to U.S. 91. These vehicles consist primarily of local passenger cars and light trucks. Forty out of state passenger cars per day or 13 percent of the total volume of out of state vehicles turn off I-15 to Old U.S. 91.

7. An origin and destination survey was conducted on Old U.S. 91 near the junction with I-15 in January, 1977 to determine the origin and destination of traffic using this facility. The results of this survey were used to determine the relative additional time and distance that would be required by the road users if U.S. 91 was abandoned.

8. A cost/benefit analysis was made by converting additional time and distance to dollars and comparing the U.S. 91 route with other alternates. The results of this analysis are as follows:

   a. The additional costs of abandonment without alternates to the users of U.S. 91 would be approximately $174. per day or $63,557 per year.

b. This cost would amount to $169. per day or $61,582 per year if improvements were made to the Harrison Avenue Interchange.

c. Additional costs would be further reduced to $152. per day or $55,692. per year if ramps could be provided on the Continental Drive separation structure.

9. The estimated cost of reconstructing the 3.1 mile section of U.S. 91 is $1,250,000. Reconstruction should be accomplished within the next 3-5 years if this section is to be retained on system. Maintenance expenditures have been averaging $13,000 per year during the past 3 years.

10. A cost/benefit analysis indicates that the road user benefits that would accrue to the 433 vehicles now using U.S. 91 would be less than the estimated expenditures for reconstruction and maintenance over a twenty year period.

I. U.S. 91 DESCRIPTION AND CHARACTERISTICS

A. Location of Highways

1. Butte Community - Butte, Montana is a mining community situated in Silver Bow County just west of the main range of the Rocky Mountains known as the Continental Divide. The city itself has two geographical characteristics - the older section built on the side of a mountain and the new development area on the flats to the south./1 The economic condition of Butte, Montana, remains to a large degree greatly dependent upon the mining and smelting operation of the Anaconda Company. The international market price of copper has, and continues to control, the viability of the industry.

   Anaconda Company's Butte Complex is located north and east of Butte. In the mid 1950's copper smelting and concentrating technology had improved to the extent that low grade ores could be profitably mined causing the opening of the Berkeley Pit in 1955. As the pit grew wider and deeper, the ore recovered has become lower in grade.

   The Berkeley Pit is worked in a multiple bench method. Rock is drilled, blasted and loaded in haul trucks. Then depending on its copper content, rock is hauled to waste dumps, leach dumps or to the crusher at the company's concentrator. The waste dumps are primarily located to the east of the Berkeley Pit complex in the vicinity of the Continental East and South Pits. See Figure 2.

/1 Source: Preliminary Environmental Review for a Proposed Expansion of Anaconda Company's Berkeley Mining Complex, Montana Department of State Lands, Helena, Montana, September 20, 1976.

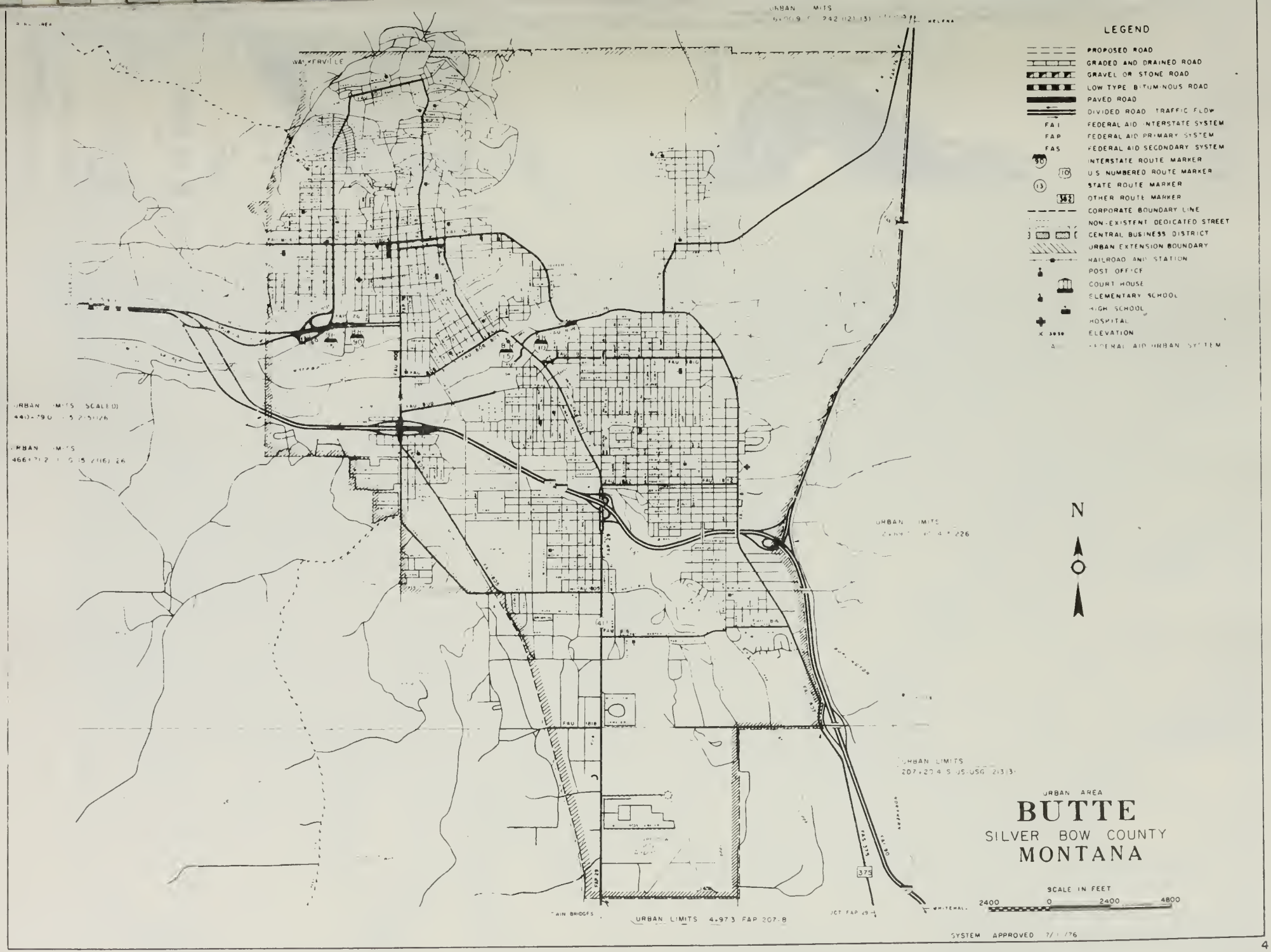

LEGEND
PROPOSED ROAD
GRADED AND DRAINED ROAD
GRAVEL OR STONE ROAD
LOW TYPE BITUMINOUS ROAD
PAVED ROAD
DIVIDED ROAD TRAFFIC FLOW
FAI FEDERAL AID INTERSTATE SYSTEM
FAP FEDERAL AID PRIMARY SYSTEM
FAS FEDERAL AID SECONDARY SYSTEM
INTERSTATE ROUTE MARKER
U S NUMBERED ROUTE MARKER
STATE ROUTE MARKER
OTHER ROUTE MARKER
CORPORATE BOUNDARY LINE
NON-EXISTENT DEDICATED STREET
CENTRAL BUSINESS DISTRICT
URBAN EXTENSION BOUNDARY
RAILROAD AND STATION
POST OFFICE
COURT HOUSE
ELEMENTARY SCHOOL
HIGH SCHOOL
HOSPITAL
ELEVATION
FEDERAL AID URBAN SYSTEM
N
URBAN AREA
BUTTE
SILVER BOW COUNTY
MONTANA
SCALE IN FEET
2400 0 2400 4800
WALKERVILLE
HELENA
TWIN BRIDGES
WHITEHALL
URBAN LIMITS 4.973 FAP 207-8
SYSTEM APPROVED

FIGURE 1


PLAN MAP
OF
OPEN PIT DEVELOPMENT
THE ANACONDA COMPANY
SCALE
0 400 800 1200 2000
JUNE, 1976
HIGHWAY 91
PIT LIMITS
HIGHWAY 91
DUMP
DUMP
BUTTE
MILL CONCENTRATOR
U.S. 15

2. Highway 91 - U.S. 91 was constructed in 1920 and reconstructed in 1950 as the main route to Butte from the north. In 1966 Interstate 15 was constructed which rerouted U.S. 91 and the majority of traffic previously using the Woodville entrance to Butte further to the south on the I-15 & 90 Interstate System. The section of U.S. 91 for which this report considers abandonment extends from the Woodville entrance south through the McQueen - East Butte-Anaconda Company Mining Complex Area terminating at the Continental Drive Intersection in Butte. See Figure 3.

B. The Anaconda Company's Request to Abandon Old U.S. 91

1. Original Request - On September 11, 1972 the Anaconda Company submitted a petition to the Montana Highway Commission to abandon and vacate a portion of U.S. 91. The abandonment petition requested that the old portion of U.S. Highway 91 be vacated from its junction with Interstate I-15 at the top of Woodville Hill westerly to the junction of Continental Drive near the intersection of Farrell and Stuart Streets a distance of 18,000± feet. Reasons for this request included:

   (a) The Anaconda Company is the owner of most of the lands abutting U.S. 91;

   (b) The Old U.S. 91 right of way is necessary for expanded mining and associated operations;

   (c) This mining expansion is of the utmost importance to the economic welfare and industrial development of Silver Bow County and the State of Montana.

   Since the original request a number of possible solutions have been considered by the Anaconda Company and Montana Department of Highways. Recently, however, the Anaconda Company's position

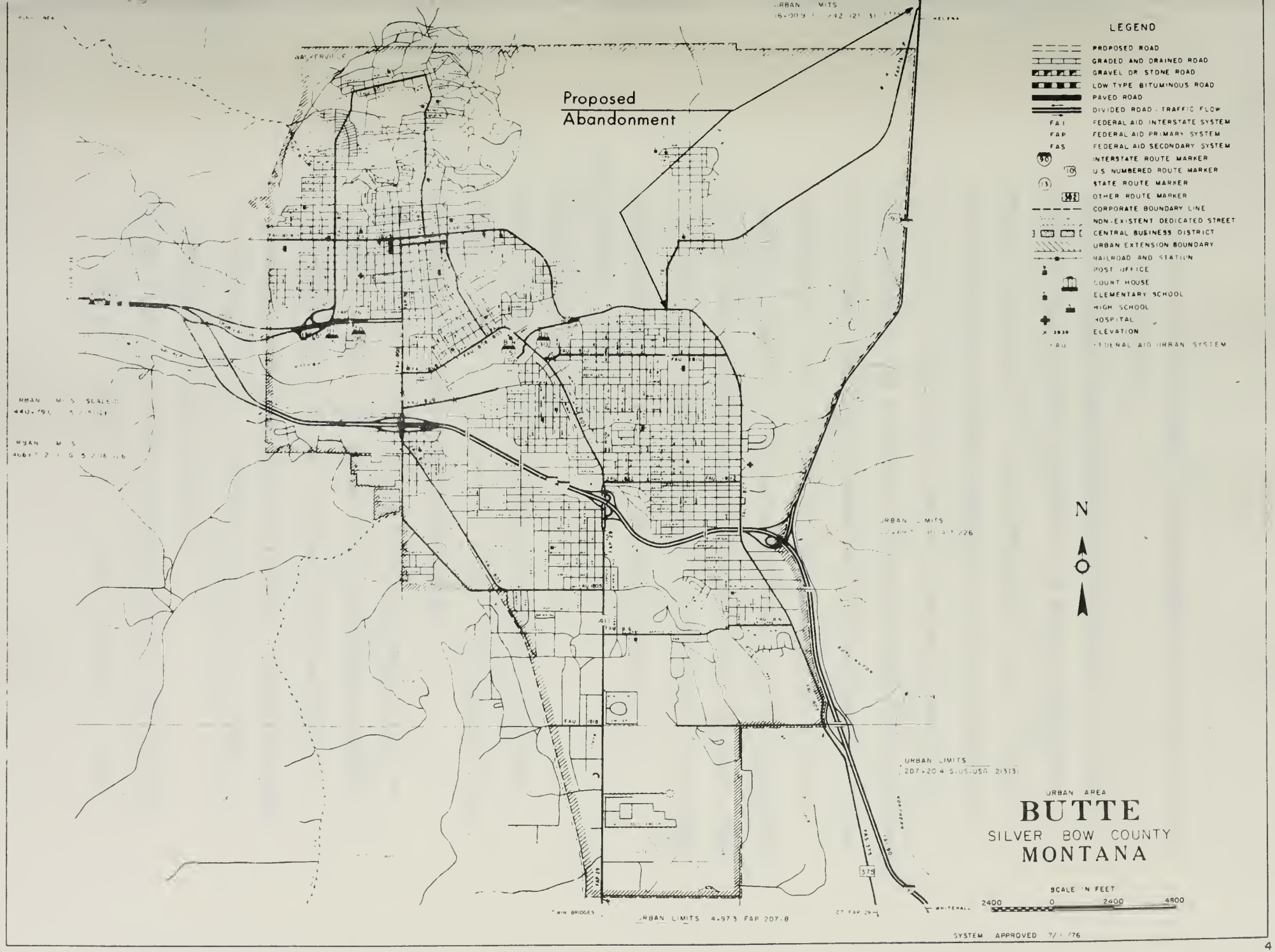

Proposed
Abandonment
LEGEND
PROPOSED ROAD
GRADED AND DRAINED ROAD
GRAVEL OR STONE ROAD
LOW TYPE BITUMINOUS ROAD
PAVED ROAD
DIVIDED ROAD - TRAFFIC FLOW
FAI FEDERAL AID INTERSTATE SYSTEM
FAP FEDERAL AID PRIMARY SYSTEM
FAS FEDERAL AID SECONDARY SYSTEM
INTERSTATE ROUTE MARKER
U.S. NUMBERED ROUTE MARKER
STATE ROUTE MARKER
OTHER ROUTE MARKER
CORPORATE BOUNDARY LINE
NON-EXISTENT DEDICATED STREET
CENTRAL BUSINESS DISTRICT
URBAN EXTENSION BOUNDARY
RAILROAD AND STATION
POST OFFICE
COURT HOUSE
ELEMENTARY SCHOOL
HIGH SCHOOL
HOSPITAL
ELEVATION
FEDERAL AID URBAN SYSTEM
N
URBAN AREA
BUTTE
SILVER BOW COUNTY
MONTANA
SCALE IN FEET
2400 0 2400 4800
URBAN LIMITS 4+973 FAP 207-8
SYSTEM APPROVED 7/1/76

Figure 3

has returned to the request for abandonment and vacation of the U.S. 91 right of way.

2. Anaconda Company's Long Range Plan - On December 21, 1976 the Anaconda Company (ACM) presented to the Montana Department of Highways Engineering Division a proposed 22 year - five phase plan indicating anticipated impacts this plan would have on Old U.S. 91. It was stated that it is essential that U.S. 91 be abandoned in the vicinity of the Berkeley and the two Continental Pits in order that ACM may expand their mining operation. Refer to Figure 2. One of the critical reasons given was a 3/4 mile reduction in hauling distance thereby reducing costs substantially with 60 trucks constantly hauling during 3 shifts per day. Phase 2 of ACM's Plan is proposed to begin in July of 1977 and depends on the outcome of the U.S. 91 abandonment proceedings.

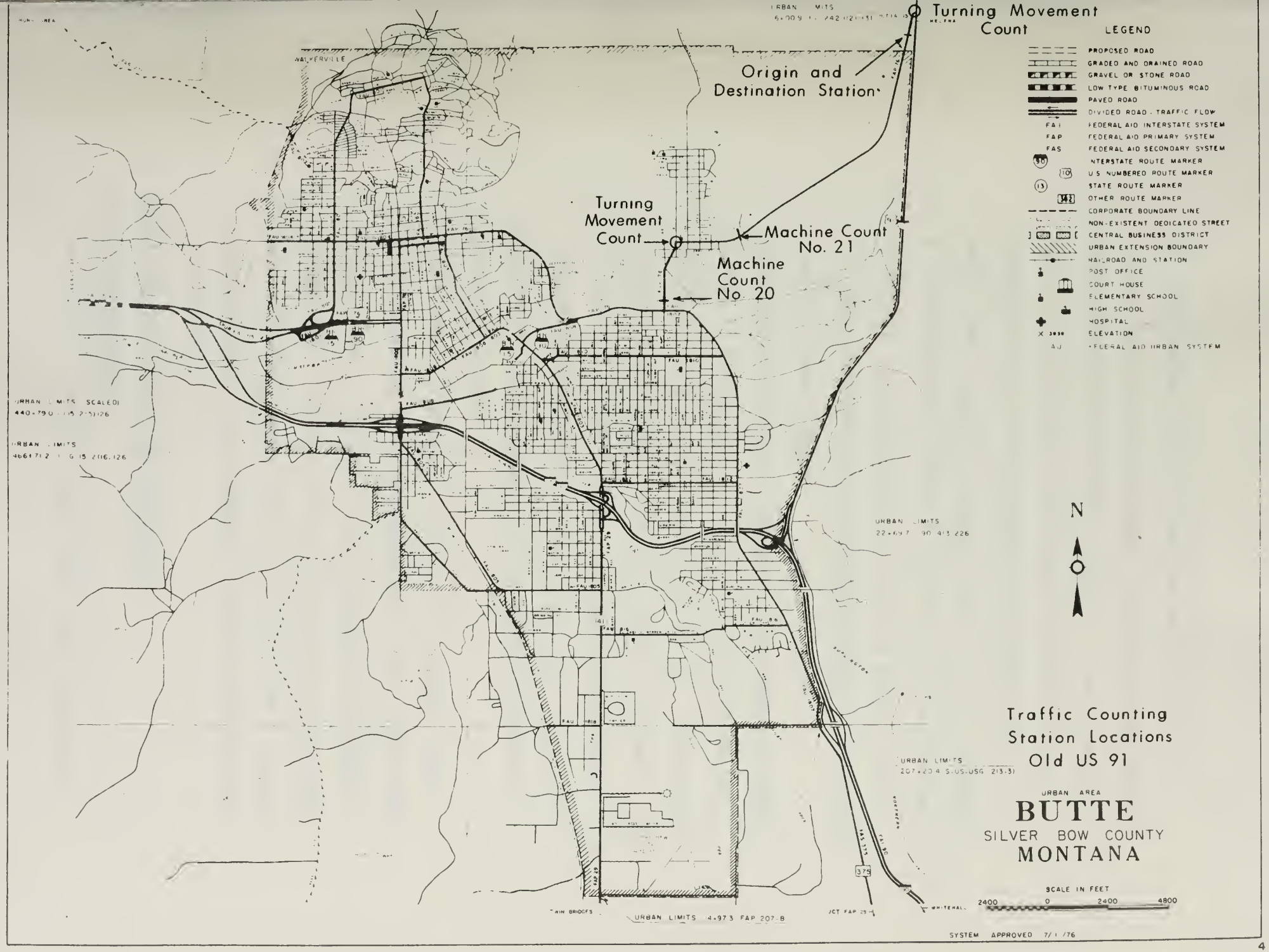
C. Daily Traffic Trends

1. Trends on Old U.S. 91

The definition of Annual Average Daily Traffic is the total traffic during the year over any facility divided by 365 days. This volume is commonly abbreviated as ADT.

(a) Interstate 15 from the East Butte Interchange with I-90 north to the top of Woodville Hill was opened to traffic in 1966. Since the construction of this section of Interstate 15 had a substantial effect in reducing traffic on Old U.S. 91 only traffic counts taken since 1967 are considered in trend evaluation.

(b) The location of traffic counting stations is illustrated in Figure 4. Station 20 is located just north of the U.S.


Turning Movement Count
Origin and Destination Station
Turning Movement Count
Machine Count No. 21
Machine Count No. 20
LEGEND
PROPOSED ROAD
GRADED AND DRAINED ROAD
GRAVEL OR STONE ROAD
LOW TYPE BITUMINOUS ROAD
PAVED ROAD
DIVIDED ROAD - TRAFFIC FLOW
FAI FEDERAL AID INTERSTATE SYSTEM
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INTERSTATE ROUTE MARKER
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CORPORATE BOUNDARY LINE
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CENTRAL BUSINESS DISTRICT
URBAN EXTENSION BOUNDARY
RAILROAD AND STATION
POST OFFICE
COURT HOUSE
ELEMENTARY SCHOOL
HIGH SCHOOL
HOSPITAL
ELEVATION
FEDERAL AID URBAN SYSTEM
N
Traffic Counting Station Locations
Old US 91
URBAN AREA
BUTTE
SILVER BOW COUNTY
MONTANA
SCALE IN FEET
2400 0 2400 4800
SYSTEM APPROVED 7/1/76

Figure 4

91 - Continental Drive intersection and Station 21 is located just east of East Butte. Traffic data for both of these stations is presented in Table I. From review of Table I it can be seen that the ADT at Station 20 has decreased since 1971 approximately 50 percent (from 4968 to 2447) during the period from 1971 - 1977. Figure 5 illustrates this decline of traffic on the lower segment of U.S. 91. Although Station 20 reflects a lower use of U.S. 91 it also reflects the Anaconda Company's trend toward lower employment levels.

Station 21 traffic data in Figure 6 also presents a steady decline in the useage of Old U.S. 91 from a high of 823 vehicles in 1970 to approximately 530 in 1977. The overall decrease at this location amounts to about 36 percent. The 1977 ADT of 530 diminished by the time it reached the U.S. 91 I-15 junction to 433 which suggests that some vehicles are destined for points between Station 21 and the Station at the top of the hill.

(c) A complete traffic count history on U.S. 91 just south of Interstate 15 is not available but a recent count taken during survey in January of 1977 indicated an estimated average daily traffic of 433 trips per day at this Station.

(d) In conclusion it appears that the overall trend is toward a a steady decline in the number of vehicles using the Old U.S. 91 highway.

2. Traffic Characteristics and Composition

(a) Turning Movements

The following turning movement counts were expanded to

TABLE I

Traffic Count Data - Old U.S. 91

	Station 20			Station 21		
Year	A.D.T.	Numerical Difference	Percent Difference	A.D.T.	Numerical Difference	Percent Difference
1970	----	----	----	823	-----	-----
1971	4968	----	----	715	-108	-13.1
1972	4998	+30	+0.6	675	-148	-20.7
1973	4330	-668	-13.4	640	-35	-5.1
1974	4330	----	----	640	____	----
1975	2931	-1399	-32.3	573	-67	-10.5
1976	2824	-107	-3.7	543	-30	-5.2
1977	2447	-377	-15.4	530	-33	-6.1

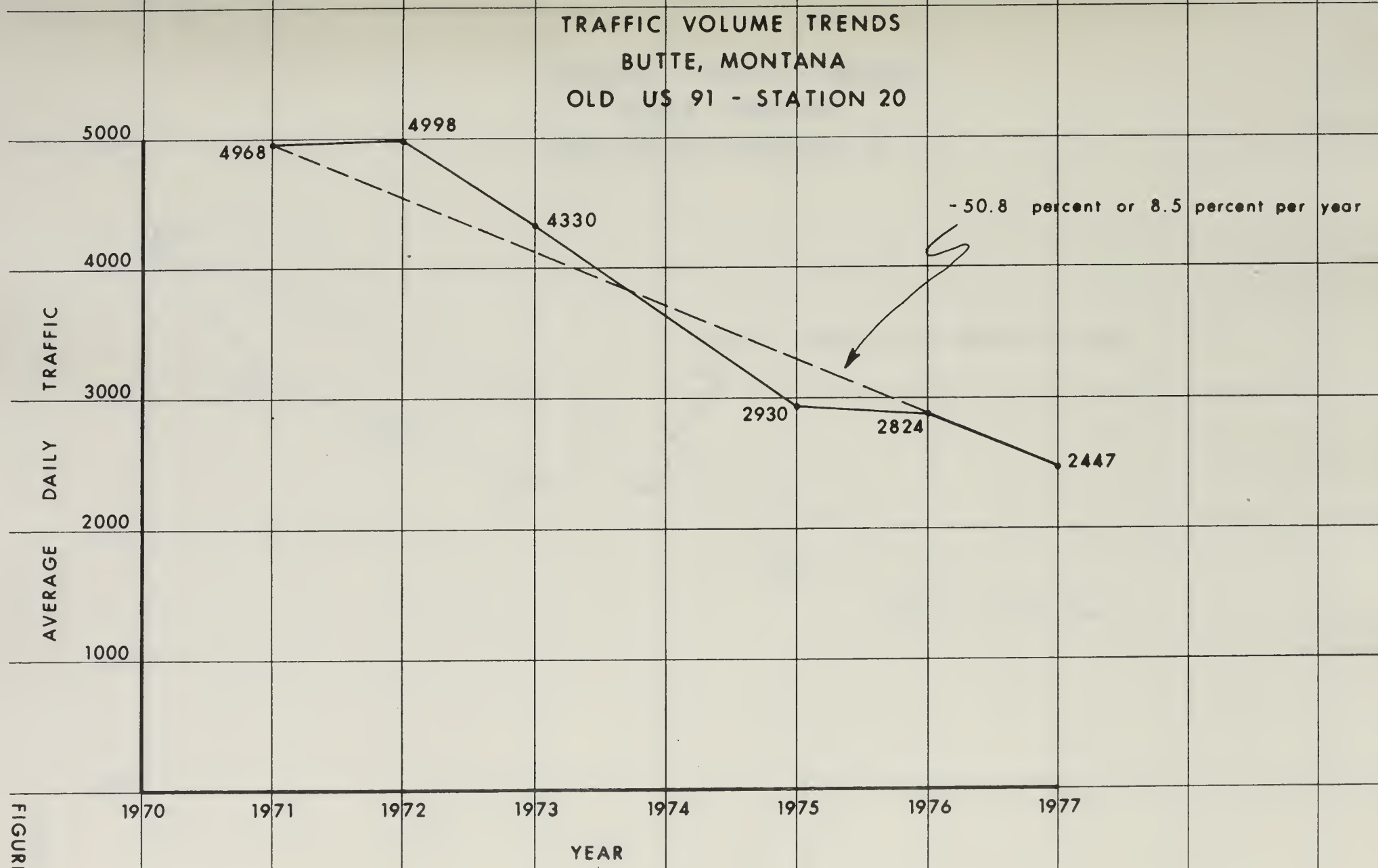

TRAFFIC VOLUME TRENDS
BUTTE, MONTANA
OLD US 91 - STATION 20
AVERAGE DAILY TRAFFIC
5000
4000
3000
2000
1000
4968
4998
4330
2930
2824
2447
-50.8 percent or 8.5 percent per year
1970
1971
1972
1973
1974
1975
1976
1977
YEAR

FIGURE 5

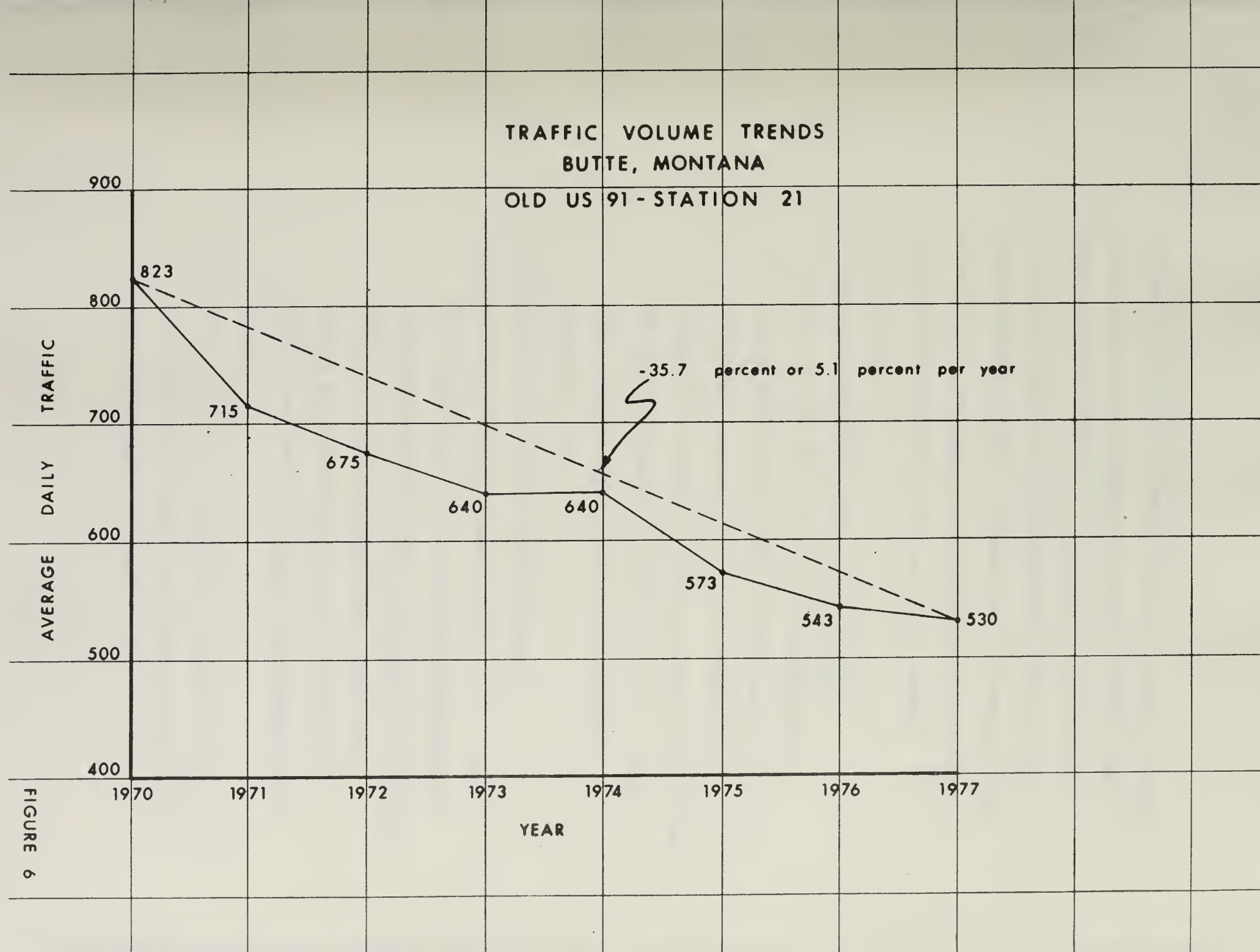

TRAFFIC VOLUME TRENDS
BUTTE, MONTANA
OLD US 91 - STATION 21
AVERAGE DAILY TRAFFIC
900
800
700
600
500
400
823
715
675
640
640
573
543
530
-35.7 percent or 5.1 percent per year
1970
1971
1972
1973
1974
1975
1976
1977
YEAR

FIGURE 6

average daily traffic estimates from peak hour manual counts taken during a survey conducted in January of 1977. The reason for the conversion to average daily traffic (ADT) is to better equate the turning movement counts with the traffic counting stations. Although turning movement counts do not exactly correspond to the traffic counting stations they are similar enough to disclose turning movement characteristics.

(1) Junction Interstate 15 and U.S. 91 (Figure 7)

(a) Total traffic on I-15 north of the junction was 1493 of which 1085 or about 73 percent was a north-south movement on I-15. The remaining 27 percent of the total I-15 traffic north of the junction or 408 vehicles turned on or off Old U.S. 91 . Twenty five vehicles per day turned on or off Old U.S. 91 from west to south.

(2) Junction U.S. 91 and Hayes Street (Figure 8)

(a) The primary traffic movement at the U.S. 91 - Hayes Street intersection is in a north-south direction to and from the Anaconda Company operations. This movement amounted to 1863 vehicles per day. Twenty nine vehicles per day used Old U.S. 91 to the east for access to and from the Anaconda Company operations to the north.

(b) The major portion of the Old U.S. 91 traffic to and from the east approximately 97 percent (611 vehicles) turned south towards Continental Drive.

Butte, Montana
MONTANA HIGHWAY COMMISSION
PLANNING SURVEY

Time Period:
From Estimate 24 hour
To

VEHICLE VOLUME SUMMARY
Regular Intersection

Date ~~January~~ 1977
Weather Clear
Prepared by

Location Intersection of I-15 and Old U.S. 91 at Woodville Hill

Estimated 1977 average daily traffic

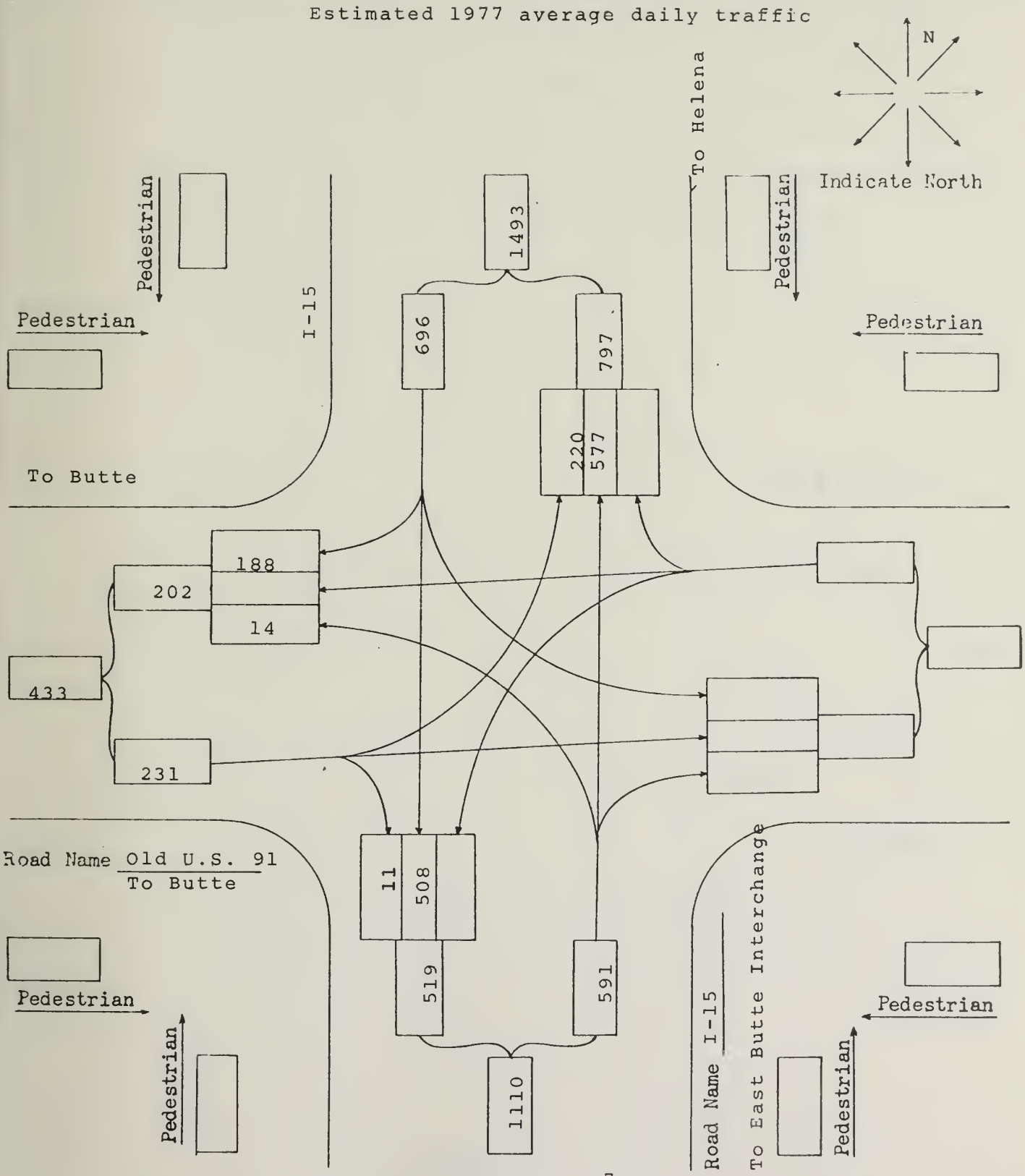


Figure 7

Butte, Montana

MONTANA HIGHWAY COMMISSION
PLANNING SURVEY

Time Period:
From Estimate 24 Hour
To

VEHICLE VOLUME SUMMARY
Regular Intersection

Date January, 1977
Weather Clear
Prepared by

Location Intersection Old U.S. 91 and Hayes Street

Estimated 1977 Average Daily Traffic

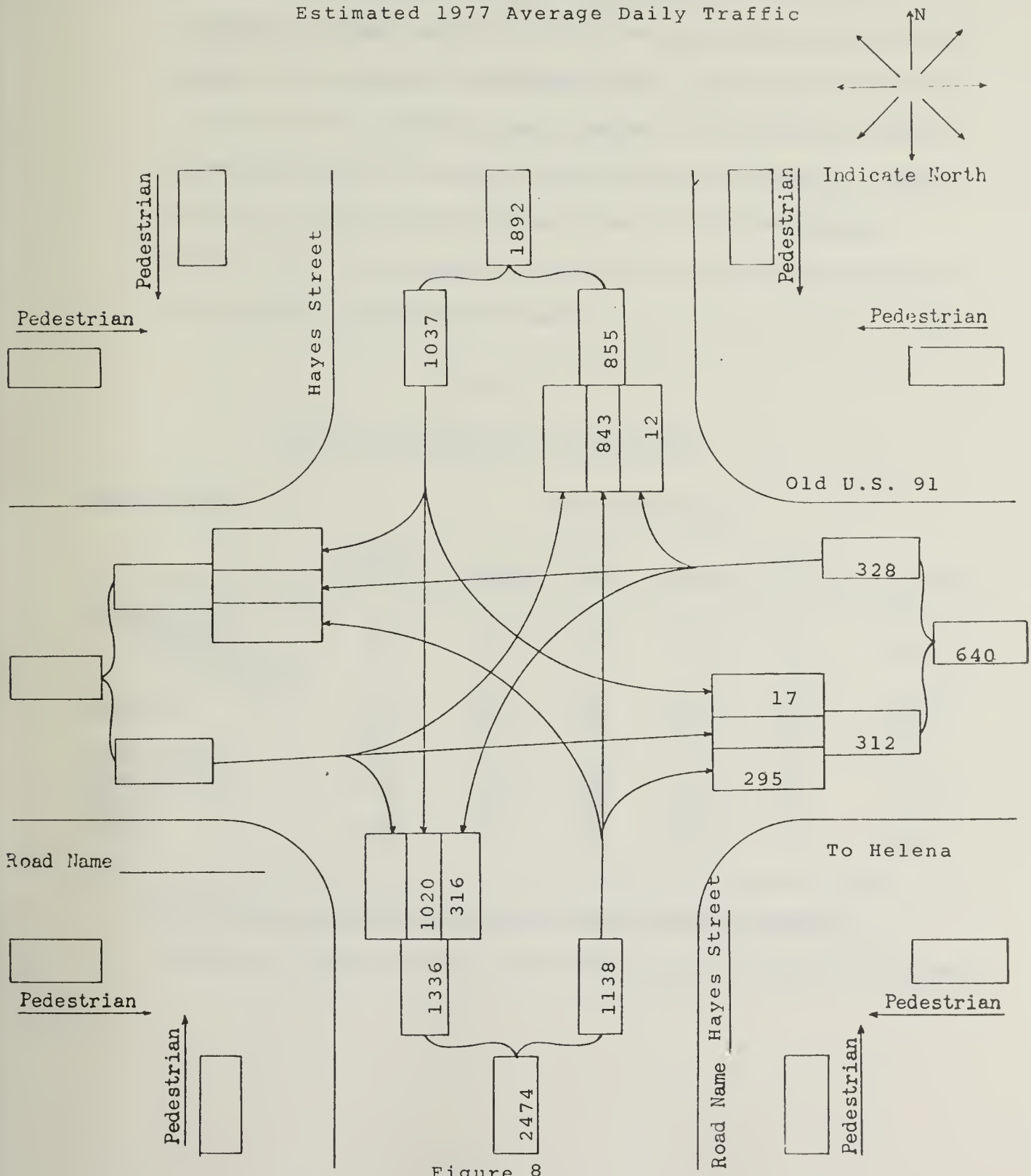


Figure 8

D. Traffic Composition

Recent classification counts indicate Old U.S. 91 primarily carries local passenger cars and light trucks as indicated in Table II. This appears reasonable since most out of state motorists and interstate truckers would have a greater tendency to follow the well marked, more convenient Interstate routes. Light trucks of the farm to market or delivery type amounted to 105 per day and there were approximately 17 larger trucks using the old facility. Only 40 out of state motorists per day turned off the Interstate to Old U.S. 91. These amounted to about 13 percent of the total out of state traffic on Interstate 15 north.

TABLE II

U.S. 91 - Interstate 15 Intersection

Vehicle Type	Intersection Leg					
	I-15 North	Percent	I-15 South	Percent	Old U.S. 91	Percent
Passenger Cars						
Montana	667	44.7	438	39.5	271	62.6
Foreign-Out of State	308	20.6	268	24.1	40	9.2
Subtotal	975	65.3	706	63.6	311	71.8
Light Trucks	332	22.2	235	21.2	105	24.3
Other Trucks	176	11.8	159	14.3	17	3.9
Busses	10	0.7	10	0.9		
Total	1493	100.0	1110	100.0	433	100.0

E. Butte Urban Area 1985 Functional Classification System Plan

Functional Classification is the process by which streets and highways

are grouped into classes, or systems, according to the character or service they are intended to provide. The following text describes the functional classification given each involved facility included in the Butte Urban Area 1985 Functional Classification System Plan:

1. Old U.S. 91 (FAP 76) - Connecting link of a rural minor arterial (was considered an urban collector) - minor arterials constitute routes whose design should be expected to provide for relatively high overall travel speeds, with minimum interference to through traffic. Connects a rural minor arterial to an urban minor arterial.
2. Interstate 15 (I-15) - Designated route of the Interstate System facility is devoted to intraregional and interregional through traffic service.
3. Continental Drive (FAU 1807) - Urban minor arterial - places more emphasis on land access than a higher system and offers a lower level of traffic mobility.
4. Harrison Avenue (FAP 29 & FAU 1803) - Urban Principal Arterial - serves major centers of activity, the highest volume corridors, and longest trip desires. Service to abutting land is subordinate to the provision of travel service to major traffic movements.

F. Butte Urban Transportation Plan - 1972

1. Old U.S. 91 Implications

   a. The Butte Urban Transportation Study 1990 Land Use Plan indicates that the entire northeast portion of Butte generally bounded by Interstate 15 on the east, Continental Drive

and Shields Avenue on the south, extension of Lee Street on the west, and the urban area boundary on the north is proposed for mining expansion and related activities.

b. In choosing a recommended street system (Page V-7) in the Butte Urban Transportation Plan the first alternate test system was based on the Butte-Silver Bow County Thoroughfare Plan. A partial diamond interchange at Interstate 15 near Columbia Gardens was included which connected to Continental Drive at Grand Avenue. Elimination of the Old Highway 91 link entering Butte from the northeast was then made and this condition held true for the three systems tested.

c. A benefit/cost analysis was then made of the Columbia Gardens Interchange and Connector (Page V-19 of the Butte Urban Transportation Plan). This analysis found that derived benefits did not outweigh the costs and the proposal could not be justified as a Federal Aid Project based on economic considerations alone. Although the Columbia Gardens Interchange proposal was not recommended in the proposed plan the Federal Highway Administration stated that local funds could be used to construct the facility. The subsequent expansion of mining activities in the vicinity of Columbia Gardens has however severed access from the north to the area that would be served by the proposed interchange and has made this interchange site unfeasible from a construction standpoint.

2. <u>1990 Plan Recommendations</u>

a. The Butte Urban Transportation Study (1972) did not recommend any future improvements on the Old U.S. 91 facility due to

the projected increase in mining activity in the area.

c. The proposed Columbia Gardens Interchange could not be justified on a cost/benefit basis but the Butte City County Planning Board retained the proposal in the plan for possible local funding.

II. EXISTING TRAFFIC SERVICE TO LAND OWNERS ALONG OLD U.S. 91

A. Immediate Local Access Responsibilities

1. East Butte - McQueen Area - To date the Anaconda Company has been acquiring substantial portions of the East Butte - McQueen Area in terms of residences and commercial structures. As of February 3, 1977 according to available Anaconda Company (ACM) information 24 residential single family units, 3 commercial establishments, two Fire Department buildings and a playground remain in the area. It is anticipated by the Anaconda Company that all properties within the East Butte - McQueen Area not owned by the Company will be acquired by July 1, 1977.

2. Mining Claims - At the northern end of Old U.S. 91 and adjacent to its junction with Interstate 15 are 40 tracts of land with non Anaconda private mining interests. These privately owned tracts depend on the U.S. 91 right of way for local access. Twenty-four of the private non Anaconda owned tracts have direct access to the Old U.S. 91 right of way. The other 16 parcels not only require U.S. 91 right of way for access but must also utilize non public access to reach U.S. 91.

3. Anaconda Company - Other than the few remaining properties in the East Butte - McQueen Area and the non Anaconda mining claim

holdings located near the Old U.S. 91 - I-15 Junction, the Anaconda Company retains ownership of all lands adjacent to the Old U.S. 91 right of way. This Anaconda Company ownership extends from the Old U.S. 91 - I-15 Junction south to the Hayes Street-Continental Drive Intersection.

4. Implications

(a) U.S. 91 should not be abandoned entirely until after:

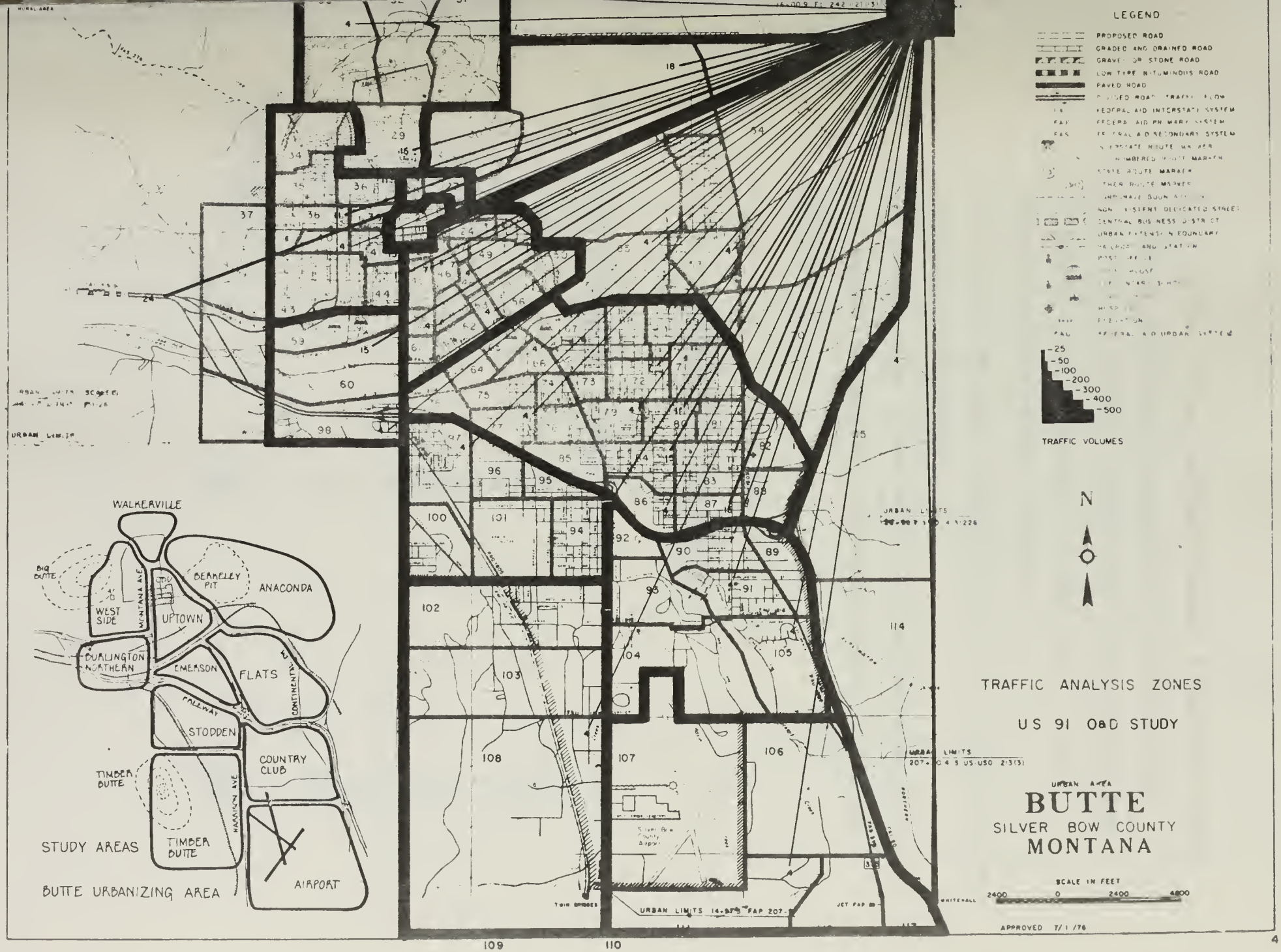
(1) All property in the East Butte - McQueen Area (Residential and Commercial) has come under the ownership of the Anaconda Company.

(2) All mining claim owners have either sold their interests to the Anaconda Company or a comparable access arrangement has been worked out to the satisfaction of the mining claim owners.

B. Origin - Destination Survey - Local and Through Traffic Service

An Origin--Destination Survey was conducted on Old U.S. 91 at the junction of U.S. 91 and Interstate 15 on January 18-19, 1977. The survey required that each vehicle, northbound be stopped and interviewed as to place of origin and place of destination. This data was then expanded to an average daily traffic figure. Of primary interest in the survey was the Butte Area trip origins utilizing the Old U.S. 91 Highway facility. Table III presents a summary of the recorded origins and the desire lines of travel are shown on Figure 9. From a review of the 433 trips (ADT) made from the Butte Area using Old U.S. 91 the following inferences can be made:

1. Ninety two percent of the total traffic using Old U.S. 91 was


LEGEND
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LOW TYPE BITUMINOUS ROAD
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FEDERAL AID INTERSTATE SYSTEM
FEDERAL AID PRIMARY SYSTEM
FEDERAL AID SECONDARY SYSTEM
STATE ROUTE MARKER
CENTRAL BUSINESS DISTRICT
URBAN EXTENSION BOUNDARY
POST OFFICE
-25
-50
-100
-200
-300
-400
-500
TRAFFIC VOLUMES
N
TRAFFIC ANALYSIS ZONES
US 91 O&D STUDY
URBAN AREA
BUTTE
SILVER BOW COUNTY
MONTANA
SCALE IN FEET
2400 0 2400 4800
APPROVED 7/1/76
WALKERVILLE
BIG BUTTE
WEST SIDE
MONTANA AVE
UPTOWN
BERKELEY PIT
ANACONDA
BURLINGTON NORTHERN
EMERSON
FLATS
CONTINENTAL
FALLWAY
STODDEN
COUNTRY CLUB
TIMBER BUTTE
HANNICKEN AVE
TIMBER BUTTE
AIRPORT
STUDY AREAS
BUTTE URBANIZING AREA
URBAN LIMITS
TWIN BRIDGES
WHITEHALL
109
110

FIGURE 2

local traffic. Of the remaining 8 percent, 5.5 percent filtered through the Butte Area from Interstate 15 & 90 to the west.

2. Almost half of the total surveyed trips (197) originated from the downtown area consisting of the Westside, C.B.D. and Uptown Study Areas. (Refer to Figure 9)
3. The Flats had the second largest amount of trip origins consisting of 85 trips or 19.5 percent.
4. The greatest number of destinations included the Helena Area 47.9 percent, Elk Park 16.2 percent, and Boulder 10.3 percent respectively.

TABLE III

Origin-Destination Summary
(See Figure 9 for Neighborhoods)

Trip Origin or Destination	Number of Trips	Percent
Walkerville	23	5.3
Westside	52	12.0
C.B.D.	111	25.5
Uptown	34	7.8
Burlington Northern	19	4.4
Emerson	8	1.8
Flats	85	19.5
Stodden	15	3.5
Country Club	15	3.5
Timber Butte	4	0.9
Airport	4	0.9
Anaconda	26	6.0
Other	4	0.9
Through Traffic		
I-90 South	11	2.5
I-15 & 90 West	24	5.5
TOTAL	433	100.0

III. ALTERNATES

Considerable study has been made of the Butte Urban Transportation System since 1970. Studies have been carried on by the Montana Department of Highways, Federal Highway Administration, Butte Silver Bow City-County Planning Board and the Butte Technical Advisory Committee in an attempt to find solutions to the access problems in Butte. The following relates to these local, State and Federal project considerations and to three potential courses of action that could be taken with Old U.S. 91. These potential courses of action include: abandon without replacement, abandon with replacement, and do not abandon. Also contained are the various alternatives of each proposal that have been considered along with their respective illustrations. The last part of the section summarizes all the alternates as to cost and feasibility.

A. Potential Courses of Action

1. Abandon Without Replacement

a. Abandon Old U.S. 91 without constructing a similar facility - It is possible that a similar facility may not be required in the vicinity of the existing U.S. 91 alignment due to the projected mining land use requirements indicated in the Butte 1990 Future Land Use Plan (Plate 15, Butte-Silver Bow, Montana Land Use Plan Preliminary - July 1970) "Mining and related industry restrict growth north and northeast". "Most growth then, is likely to occur to the south between the C.M.ST.P.&.P. Railroad on the west and Interstate Highway 90 on the east . . . .: (Page 6-1, Butte-Silver Bow, Montana Land Use Preliminary - July 1970)

b. Abandon Old U.S. 91 without providing modifications to other parts of the Butte Transportation System - This condition would not appear feasible since the Montana Department of Highways and

local government still have some obligation to the 433 users of the Old U.S. 91 Highway. The Old U.S. 91 facility presently is classified as an arterial and is still primarily functioning as such. The Montana Department of Highways and local government also have a certain obligation to the existing non Anaconda owned interests in the area such as the remaining residential and commercial properties and mining claims. With this committment, modifications alleviating the loss of direct access via Old U.S. 91 to Interstate 15 would appear to be needed.

2. Abandon with Replacement

The purpose of an alternative to the Old U.S. 91 Highway facility would be to improve access to Interstate 15 for Butte Area motorists most directly affected by the proposed abandonment. Table III indicates that the Flats and Uptown Areas would be most affected by the abandonment. The north Flats Area having most direct access to Interstate 15 through use of Old U.S. 91 would be most severely affected by the closure. For the North Flats Area ideally an interchange facility located in the vicinity of Columbia Gardens would best mitigate abandonment of U.S. 91. Ramp facilities provided at the Continental Drive - I-90 separation would appear to be second best alternative. Improvements to the Harrison Avenue Interchange with the intention of alleviating cross traffic turning movements would tend to benefit both the Uptown and Flats Study Areas. Actual benefit analysis of each feasible alternate will be considered in the benefit/cost section of this study.

a. Similar Replacement Facilities

1. Columbia Gardens Interchange

(a) Alternative #1 - Grand Avenue

Refer to Figure 10.

(b) Alternative #2 - Cobban Street

Refer to Figure 10.

Feasibility

(a) Unfeasible due to present and anticipated Anaconda mining activity in this area.

(b) Butte Transportation Plan indicates benefits do not justify costs.

(c) Butte-Silver Bow, Montana Land Use Plan Preliminary-July 1970 substantiates increased mining activity in this area and a shift in new community development to the south.

b. Other Possible System Modifications

1. Upgrade Harrison Avenue Interchange

(a) Alternate A - Refer to Figure 11

(b) Alternate B - Refer to Figure 12

(c) Alterante C - Refer to Figure 13

(d) Alternate D - Refer to Figure 14

Feasibility

The proposed modifications are still under study but Alternates A and C appear to produce the most benefits. Reducing cross traffic turning movements would provide for an easier flow of traffic, increase capacity and allow for increased traffic volumes.

2. Shift East Butte Interchange and Provide Ramps on Continental Drive - I-90 Separation Structure

(a) Alternate A - Refer to Figure 15

(b) Alternate B - Refer to Figure 16

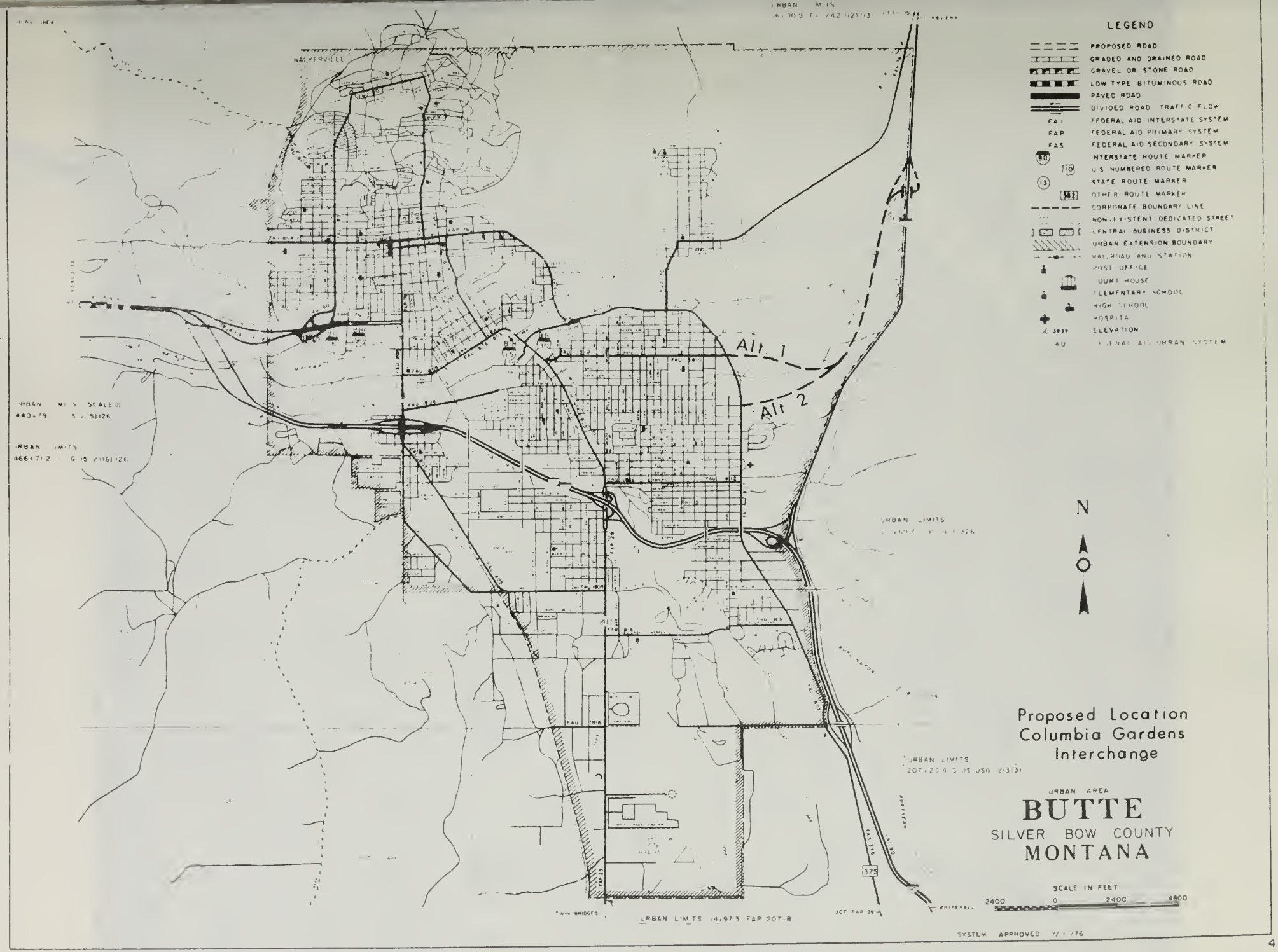

LEGEND
PROPOSED ROAD
GRADED AND DRAINED ROAD
GRAVEL OR STONE ROAD
LOW TYPE BITUMINOUS ROAD
PAVED ROAD
DIVIDED ROAD TRAFFIC FLOW
FAI FEDERAL AID INTERSTATE SYSTEM
FAP FEDERAL AID PRIMARY SYSTEM
FAS FEDERAL AID SECONDARY SYSTEM
INTERSTATE ROUTE MARKER
U.S. NUMBERED ROUTE MARKER
STATE ROUTE MARKER
OTHER ROUTE MARKER
CORPORATE BOUNDARY LINE
NON-EXISTENT DEDICATED STREET
CENTRAL BUSINESS DISTRICT
URBAN EXTENSION BOUNDARY
RAILROAD AND STATION
POST OFFICE
COURT HOUSE
ELEMENTARY SCHOOL
HIGH SCHOOL
HOSPITAL
ELEVATION
AU FEDERAL AID URBAN SYSTEM
Alt 1
Alt 2
N
Proposed Location
Columbia Gardens
Interchange
URBAN AREA
BUTTE
SILVER BOW COUNTY
MONTANA
SCALE IN FEET
2400 0 2400 4800
URBAN LIMITS
URBAN LIMITS 14+97.3 FAP 207-8
SYSTEM APPROVED 7/1/76

Figure 10


ALTERNATE "A"
HARRISON AVE
INTERCHANGE
BUTTE
NORTH
SCALE: 1" = 200'
INTERSTATE
15
INTERSTATE
90
HARRISON AVE

FIGURE 11

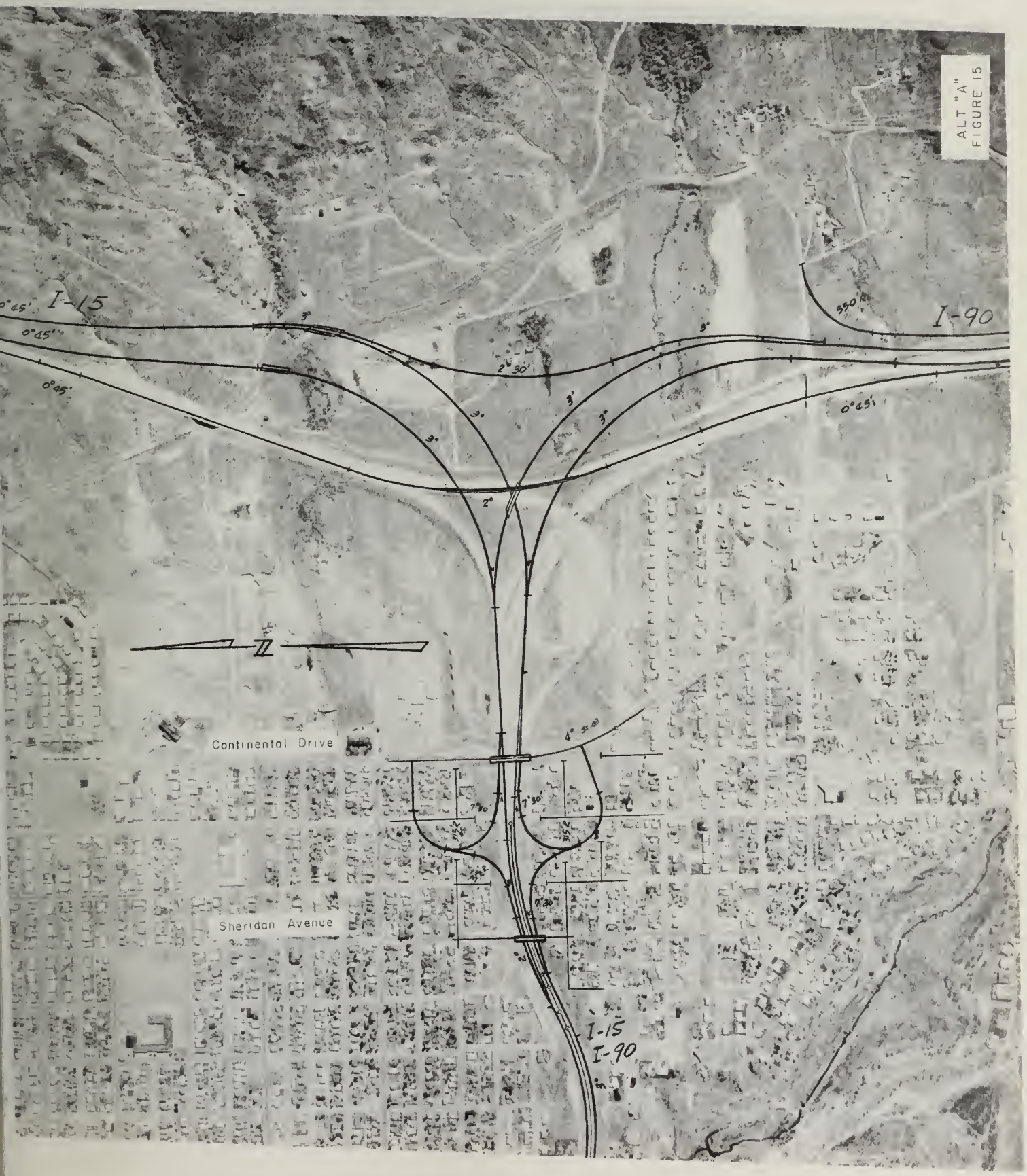

HARRISON AVE
INTERCHANGE
BUTTE
ALTERNATE "B"
NORTH
SCALE: 1" = 200'
15
90
HARRISON
DEWEY BLVD

FIGURE 12


ALTERNATE "C"
HARRISON AVE
INTERCHANGE
BUTTE
NORTH
SCALE: 1" = 200'
HARRISON
INTERSTATE
15
INTERSTATE
90
DEWEY BLVD
BUSCH ST

FIGURE 13


HARRISON AVE.
90
15
HARRISON AVE.
BUTTE


ALT "A"
FIGURE 15
I-15
I-90
Continental Drive
Sheridan Avenue
I-15
I-90


ALT. "B"
FIGURE 16
I-15
I-90
Continental Drive
Sheridan Avenue
I-15
I-90

Feasibility

At this time it appears the two alternates would be unfeasible due to the substantial cost involved with moving and reconstructing the East Butte Interchange. The East Butte Interchange is presently considered for relocation to the east in order to provide adequate space for ramps at the Continental Drive - I-90 separation. Consideration of reduced standards in ramp design and not moving the East Butte Interchange would increase the feasibility of using this alternate.

3. Frontage Road from the top of Woodville Hill South along I-15 on the west side to connect with Continental Drive. This has been a relatively new consideration and as yet does not have a sketch or cost estimate available. It has however been investigated by Department of Highways Division Personnel and considered not feasible due to heavy grading, very steep grades and the alignment becoming involved with the ACM waste dump near Columbia Gardens.

3. Not Abandon

a. Retain Old U.S. 91 - The existing section of highway from I-15 near Woodville Hill southwesterly 3.1 miles was constructed in 1950 and it hastherefore been in service longer than its expected life of 20 years. It is anticipated that if this section is retained in service it will require reconstruction within the next 3-5 years at an estimated cost of $1,250,000. Maintenance costs on the 3.1 mile section have averaged approximately $13,000 per year during the past 3 years for patching, snow removal, sanding, etc.

b. Possible Local Economic Implications

It is possible that should the "not abandon" alternate be

approved that the additional hauling costs to the Anaconda Company as was previously stated may lead to a continued decline in mining employment in the Butte Urban Area.

TABLE IV

Summary of Alternate Costs

Alternates	R/W & Utilities	Construction	Total	Feasibility
I. Columbia Gardens Interchange				
Alternate 1 Grand Ave.	$75,000 (1973)	$2,140,000 (1973)	$2,215,000	Benefits did not outweigh costs-unfeasible
Alternate 2 Cobban St.	$75,000 (1973)	$2,140,000 (1973)	$2,215,000 (1973)	Benefits did not outweigh costs-unfeasible
II. Upgrade Harrison Ave. Interchange				
Alternate A	$623,249	$476,335	$1,099,584	Most Feasible
Alternate B	$567,600	$957,415	$1,525,015	Moderately Feasible
Alternate C	$403,600	$337,122	$740,722	Most Feasible
Alternate D	$8,700,000	$3,500,000	$12,200,000	Least Feasible
III. East Butte Continental Drive				
Alternate A	N/A	$8,098,315 (1974)	N/A	Least Feasible
Alternate B	N/A	$7,446,315 (1974)	N/A	Least Feasible
Provide Ramps only at Continental Drive	N/A	N/A	N/A	Possible
IV. Frontage Road	N/A	N/A	N/A	Unfeasible
V. Retain Old U.S. 91	-Reconstruction (1976)		$1,250,000	----------
	Maintenance		$ 13,000 (Annual)	----------

IV. Benefit/Cost Analysis

A. Process

1. Time, Distance, and Evaluation Methodolgy

U.S. 91 and the major routes that could serve as alternates to U.S. 91 were driven by Montana Department of Highways staff in order to establish average speed, delay time, and distance for route evaluation. This speed and delay criteria was then expanded and applied to a shortest trip link route from the center of each neighborhood area to the U.S. 91 - Interstate 15 Junction. Old U.S. 91 was then designated as the base condition and compared to the three alternates: 1) distribution over the existing Butte street and highway network without improvements, 2) improvements provided the Harrison Avenue - Interstate interchange, and 3) ramp improvements provided the Continental Drive - Interstate overpass.

2. Establishment of Time and Vehicle Costs

a. Value of Time Saved

Vehicle occupant time costs were developed through use of a publication entitled, "User Benefit Analysis for Highway and Bus Transit Improvements" provided by the National Cooperative Highway Research Program, Transportation Research Board, National Research Council in 1975. The publication suggested that the value of a vehicle occupant's time is related to trip type, median family income, trip time saving, and vehicle occupancy. Based on the Butte Transportation Study of 1972 vehicle occupancy rate of 2.20 persons per vehicle, an estimate of value of time per vehicle minute of almost four (0.0396) cents was derived.

b. Vehicle Operating Costs

Costs of operating a vehicle were developed from a publication prepared by the U.S. Department of Transportation in 1976. The publication entitled, "Cost of Owning and Operating an Automobile" provided costs per mile data for standard, compact and sub-compact vehicles. An average of the three vehicle sizes with respect to operating costs was 15.03 cents per vehicle mile.

B. Results

1. Base Condition-Distribution over Existing System without U.S. 91

Findings: (Refer to Table V)

a. The cost to the Butte community of abandoning the Old U.S. 91 facility is estimated at $174.13 per day or an annual cost of (365 days x $174.13) = $63,557.45.

b. The Burlington Northern, Emerson and neighborhood areas south of Interstate 90 and Interstate 15 actually gain in terms of time by not using Old U.S. 91, but with the exception of these few south neighborhood areas the closing of Old U.S. 91 will result in additional distance to be traveled by over 90.0 percent of the vehicles presently using Old U.S. 91.

c. Closing of U.S. 91 and subtracting through trips that did not benefit by using Old U.S. 91 would mean an additional local travel time of 0.85 minutes and 22.19 miles per day.

2. Alternate - Upgrade Harrison Avenue Interchange

Findings: (Refer to Table VI)

a. It is estimated the daily cost to the Butte community for abandoning Old U.S. 91 but providing for ramp improvements to the Harrison Avenue Interchange would drop the daily cost from

$174.13 to $168.72 per day or a difference of almost $2000 per year. (365 days x $168.72) = $61,582,80. ($63,557-$61,582)=$1975.

b. Improvements to the Harrison Avenue Interchange would effect the uptown, Anaconda (ACM), Emerson, Flats and neighborhood areas south of I-90 - I-15 Interstate benefiting 44 percent of the total or 191 vehicle trips presently made over Old U.S. 91.

c. Improving the Harrison Avenue Interchange would save on the average of 4.04 minutes/day/vehicle and 1.60 miles/day/vehicle with closure of Old U.S. 91.

3. Alternate - Provide Ramps at the Continental Drive-I-90 Separation

a. The daily cost of abandoning U.S. 91 and providing this alternate would amount to $152.58 or an annual cost of (365 days x $152.58)= $55,691.70 per year. By providing ramps to the Continental Drive I-90 separation the cost per year of abandoning Old U.S. 91 would be reduced almost $8,000.00.

b. The Continental Drive I-90 Overpass ramp improvements would benefit the Anaconda (ACM), Flats and Country Club neighborhood areas affecting the travel of 126 vehicles or 29% of the total Old U.S. 91 trips.

c. Providing ramps to the Continental Drive I-90 Overpass, not providing improvements to the Harrison Avenue Interchange and closing U.S. 91 would allow on the average a reduction of both 5.09 minutes/day/vehicle and 3.56 miles/day/vehicle.

C. Benefit/Cost/Estimate

1. Construction Costs

The cost of reconstructing Old U.S. 91 at 1976 prices is estimated at $1,250,000 for the 3.1 mile section of highway. In Section III, A, 3 of this study it was estimated that reconstruction would be required in 3 to 5 years. Annual cost of construction =

$1,250,000 ÷ 20 year life = $62,500 per year.

2. Maintenance Costs

Cost of maintaining the 3.1 miles of roadway is estimated at #13,000 per year from the U.S. 91 - I-15 junction south to Continental Drive.

3. Benefit/Cost Ratio

$$\text{Benefit Ratio} = \frac{\text{Benefits}}{\text{Costs}}$$

$$\frac{\text{Abandon U.S. 91 (Annual Cost to Road Users)}}{\text{Construction + Maintenance (Annual Cost)}} = \frac{\$63,557.45}{\$75,500.00} = 0.84$$

Interest charges were not included in any of the estimated costs used in the above formula.

A factor of 1.00 would indicate that benefits would be equal to costs. The factor of 0.84 would suggest the following:

a. Benefits of retaining this segment of Old U.S. 91 are not equal to costs. In other words the present usage by 433 vehicles per day does not justify the projected reconstruction and maintenance costs for Old U.S. 91 over a 20 year period.

b. The high factor of 0.84 would however indicate that the U.S. 91 facility is being used and does have some value to the local Butte Community.

TABLE V
BASE CONDITION
DISTRIBUTION OVER EXISTING
SYSTEM WITHOUT U.S. 91

Neighborhood Area	Trips	Neighborhood Area to U.S. 91-I15 Junction Via	Difference between Existing U.S. 91 & Abandoning U.S. 91		Average Daily Cost Difference
			Minutes	Miles	$
North of I90 & I15					
Walkerville	23	Montana St.-I-15	+2.62	+3.00	12.76
C.B.D.	111	Montana St.-I-15	+2.62	+3.00	61.57
Uptown	34	Harrison Ave.-I-15	+2.57	+2.54	16.44
Westside	52	Montana St.-I-15	+1.89	+2.89	25.93
Burlington Northern	19	Montana St.-I-15	-0.95	+1.91	4.74
Anaconda ACM	26	Harrison Ave.-I-15	+9.83	+5.86	33.02
Emerson	8	Harrison Ave.-I-15	-1.19	+1.34	1.23
Flats	85	Harrison Ave.I-15	+0.86	+2.00	28.45
South of I-90 & I-15					
Stedden	15	S. Harrison Ave.-I15	-5.39	-0.46	-4.24
Timber Butte	4	S. Harrison Ave.-I15	-4.89	-0.26	-0.93
Country Club	15	S. Harrison Ave.-I15	-2.23	+0.76	+0.26
Airport	4	S. Harrison Ave.-I15	-4.89	-0.26	-0.93
I90 & I15 (West)	24	I-90 - I-15	-2.77	+1.31	+2.10
I90 (South)	15	I-90 - I-15	-5.43	-1.35	-6.27
TOTAL	433		-7.35	+22.15	$174.13
		Less Through Trips that did not have a time benefit in using Old U.S. 91	+0.85	+22.19	

TABLE VI
ALTERNATE
UPGRADE HARRISON AVENUE INTERCHANGE

Neighborhood Area	Trips	Neighborhood Area to U.S. 91 - I-15 Junction Via	Difference Between Existing U.S. 91 & Harrison Ave. Upgrade		Average Daily Cost Difference
			Minutes	Miles	$
North of I90 & I15					
Walkerville	23	Montana St.-I-15	+2.62	+3.00	+12.76
C.B.D.	111	Montana St.-I-15	+2.62	+3.00	+61.57
Uptown	34	Harrison Ave.-I-15	+2.07	+2.34	+14.75
Westside	52	Montana St.-I-15	+1.89	+2.82	+25.93
Burlington Northern	52	Montana St. -I-15	-0.95	+1.91	+4.72
Anaconda ACM	26	Harrison Ave.-I-15	+9.29	+5.66	+31.69
Emerson	8	Harrison Ave.-I-15	-1.69	+1.14	+0.83
Flats	85	Harrison Ave.-I-15	+0.36	+1.80	+24.21
South of I-90 & I-15					
Stedden	15	S. Harrison Ave.-I15	-5.89	-0.66	-4.99
Timber Butte	4	S. Harrison Ave.-I15	-5.39	-0.46	-1.13
Country Club	15	S. Harrison Ave.-I15	-2.73	+0.50	-0.49
Airport	4	S. Harrison Ave.-I15	-5.39	-0.46	-1.13
I90 & I15 (West)	24	I-90 & I-15	0.00	0.00	0.00
I-90 (South)	15	I-90 & I-15	0.00	0.00	0.00
TOTAL	433		-3.19	+20.59	$168.72

TABLE VII
ALTERNATE
RAMP CONTINENTAL DRIVE-I-90 SEPARATION

Neighborhood Area	Trips	Neighborhood Area to U.S. 91 - I-15 Junction Via	Difference Between Existing U.S. 91 & Continental Dr. Int. Minutes	Miles	Average Daily Cost Difference $
North of I-90 & I-15					
Walkerville	23	Montana St.-I-15	+2.62	+3.00	12.76
C.B.D.	111	Montana St.-I-15	+2.62	+3.00	61.57
Uptown	34	Harrison Ave.-I-15	+2.57	+2.54	16.44
Westside	52	Montana St.-I-15	+1.89	+2.82	25.93
Burlington Northern	19	Montana St.-I-15	-0.95	+1.91	4.73
Anaconda ACM	26	Continental-I-15	+6.87	+4.40	24.26
Emerson	8	Harrison Ave.-I-15	-1.19	+1.34	1.23
Flats	85	Continental-I-15	-0.05	+1.20	15.16
South of I-90 & I-15					
Stedden	15	S. Harrison-I-15	-5.39	-0.46	-4.24
Timber Butte	4	S. Harrison-I-15	-4.89	-0.26	-0.93
Country Club	15	Continental-I-15	-3.45	-0.60	-3.40
Airport	4	S. Harrison-I-15	-4.89	-0.26	-0.93
I-90 & I-15 (West)	24	I-90 & I-15	0.00	0.00	0.00
I-90 (South)	15	I-90 & I-15	0.00	0.00	0.00
TOTAL	433		-4.24	+18.63	$152.58